इंटरनेट मानक

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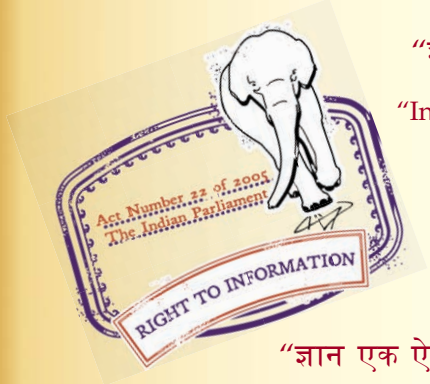
"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS/QC 790202 (1993): Semiconductor Devices - Integrated Circuits - Analogue Integrated Circuits - Blank Detail Monolithic Integrated Operational Amplifiers [LITD 5: Semiconductor and Other Electronic Components and Devices]



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Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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IS QC 790202 : 1993
IEC QC 790202 : 1991
(Reaffirmed 2006)

भारतीय मानक

मोनोलिथिक समाकलित कार्यकारी एम्प्लीफायरों के लिये खाली विवरण विशिष्टि

Indian Standard

SEMICONDUCTOR DEVICES — INTEGRATED CIRCUITS — ANALOGUE INTEGRATED CIRCUITS — BLANK DETAIL SPECIFICATION FOR MONOLITHIC INTEGRATED OPERATIONAL AMPLIFIERS

UDC 621·375·4 : 621·3·049·774

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December 1993

Price *Rs* 80.00

Indian Standard

SEMICONDUCTOR DEVICES — INTEGRATED CIRCUITS — ANALOGUE INTEGRATED CIRCUITS — BLANK DETAIL SPECIFICATION FOR MONOLITHIC INTEGRATED OPERATIONAL AMPLIFIERS

NATIONAL FOREWORD

This Indian Standard, which is identical with IEC Pub 748-3-1/QC 790202 (1991-07) 'Semiconductor devices — Integrated circuits — Part 3 : Analogue integrated circuits, Section one — Blank detail specification for monolithic integrated operational amplifiers', issued by the International Electrotechnical Commission (IEC), was adopted by the Bureau of Indian Standards on the recommendation of the Semiconductor Devices and Integrated Circuits Sectional Committee (LT 10) and approval of the Electronics and Telecommuication Division Council.

The text of IEC Standard has been approved as suitable for publication as Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker while in Indian Standards the current practice is to use a point (.) as the decimal marker.

In the adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
IEC Pub 747-10/QC 700000 (1991) Semiconductor devices — Part 10 : Generic specification for discrete devices and integrated circuits	IS QC 700000 Semiconductor devices — Generic specification for discrete devices and integrated circuits	Identical
IEC Pub 748-11/QC 790100 (1990) Semiconductor devices — Integrated circuits — Part 11 : Sectional specification for integrated excluding hybrid circuits	IS QC 790100 Semiconductor devices — Integrated circuits — Sectional specification for integrated circuits excluding hybrid circuits	Identical
IEC QC 001002 (1986) : Rules of procedure of the IEC quality assessment systems for electronics components (IECQ)	IS QC 001002 Rules of procedure of the IEC quality assessment system for electronic components (IECQ)	Identical

The concerned technical committee has reviewed the provisions of the IEC Pub 68-2-17, IEC Pub 747-1 (1983), IEC Pub 748-1 (1984) and IEC Pub 749 (1984), referred in this adopted standard and has decided that they are acceptable for use in conjunction with this standard.

This standard is intended primarily for use under the IECQ System. A regular Indian Standard for this component could be different, identical or similar to this standard.

Only the English language text in the International Standard has been retained while adopting it in this standard.

As in the Original Standard, this Page is Intentionally Left Blank

INTRODUCTION

The IEC Quality Assessment System Electronic Components is operated in accordance with the statutes of the IEC and under the authority of the IEC. The object of this system is to define quality assessment procedures in such a manner that electronic components released by one participating country as conforming with the requirements of an applicable specification are equally acceptable in all other participating countries without the need for further testing.

This blank detail specification is one of a series of blank detail specifications for semiconductor devices and shall be used with the following IEC Publication:

747-10/QC 700000 (1991): *Semiconductor devices. Part 10: Generic specification for discrete devices and integrated circuits.*

Required information

Numbers shown in brackets on this and the following pages correspond to the following items of required information, which shall be entered in the spaces provided.

Identification of the detail specification

[1] The name of the National Standards Organization under whose authority the detail specification is issued.

[2] The IECQ number of the detail specification.

[3] The numbers and issue numbers of the Generic and Sectional specifications.

[4] The national number of the detail specification, date of issue and any further information, if required by the national system.

Identification of the component

[5] Main function and type number, e.g. microprocessor integrated circuit 68 000.

[6] Information on typical construction (materials, main technology) and the package. If the device has several kinds of derivative products, the differences should be indicated, e.g. features of the characteristics in the comparison table.

If the device is electrostatic sensitive, a caution statement shall be added in the detail specification.

[7] Outline drawing, terminal identification, marking and/or reference to the relevant document for outlines.

[8] Category of assessed quality according to subclause 2.6 of the generic specification.

[9] Reference data.

[The clauses given in square brackets on the following pages of this standard are intended for guidance to the specification writer and shall not be included in the detail specification.]

[When confusion may arise as to whether a paragraph is only meant as an instruction to the writer or not, it shall be given in brackets.]

<table>
<tr><td>[Name (address) of responsible NAI (and possibly of body from which specification is available).] [1]</td><td>[Number of IECQ detail specification, plus issue number and/or date.] [2]
QC 790202-...</td></tr>
<tr><td>ELECTRONIC COMPONENT OF ASSESSED QUALITY IN ACCORDANCE WITH: [3]
Generic specification:
Publication 747-10 / QC 700000
Sectional specification:
Publication 748-11 / QC 790100
[and national references if different.]</td><td>[National number of detail specification.] [4]
[This box need not be used if the national number repeats the IECQ number.]</td></tr>
<tr><td colspan="2">DETAIL SPECIFICATION FOR MONOLITHIC INTEGRATED OPERATIONAL AMPLIFIERS [5]
[Type number(s) of the relevant device(s).]
Ordering information: see subclause 1.2 of this standard.</td></tr>
<tr><td rowspan="3">MECHANICAL DESCRIPTION [7]
Outline references:
[Standard package reference should be given, IEC number (mandatory if available) and/or national number.]

Outline drawing
[may be transferred to or given with more details in clause 8 of this standard].

Terminal identification
[drawing showing pin assignments, including graphical symbols].

Marking: [letters and figures, or colour code].
[The detail specification shall prescribe the information to be marked on the device, if any.]
[See subclause 2.5 of the generic specification and/or subclause 1.1 of this standard.]</td><td>SHORT DESCRIPTION [6]
Application: see clause 6 of this standard
Function: see clause 3 of this standard
Typical construction: [Si, monolithic, bipolar, MOS.]

Encapsulation: [cavity or non-cavity.]
[Comparison table of characteristics for variant products.]

Caution: Electrostatic sensitive devices.</td></tr>
<tr><td>CATEGORIES OF ASSESSED QUALITY [8]
[from subclause 2.6 of the generic specification.]</td></tr>
<tr><td>REFERENCE DATA [9]
[Reference data on the most important properties to permit comparison between types.]</td></tr>
<tr><td colspan="2">Information about manufacturers who have components qualified to this detail specification is available in the current Qualified Products List.</td></tr>
</table>

1 Marking and ordering information

1.1 *Marking*

[See subclause 2.5 of generic specification.

The detail specification shall prescribe the information to be given for the relevant types, such as letters, figures and/or codes.

When the marking contains information other than that specified in subclause 2.5 of the generic specification, e.g., details for the manufacturer's internal use, these details should be distinguished.

If all the information has already been given in box [7] on page 9, this shall be indicated.]

1.2 *Ordering information*

[The following minimum information is necessary to order a specific device, unless otherwise specified:

- precise type reference (and nominal voltage value, if required);
- IECQ reference of detail specification with issue number and/or date when relevant;
- category of assessed quality as defined in clause 9 of the sectional specification and, if required, screening sequence as defined in clause 8 of the sectional specification;
- package for delivery;
- any other particulars.]

2 Application related description

[Information on application in equipment or circuits and its relation to the associated devices shall be given here. The content will depend on the function to be described.]

3 Specification of the function

[A detailed block diagram or equivalent circuit information of the integrated circuit shall be given, if necessary.]

4 Limiting values (absolute maximum rating system)

These values apply over the operating temperature range, unless otherwise specified.

[Repeat only subclause numbers used, with title. Any additional values shall be given at the appropriate place, but without subclause number(s).]

[Curves shall preferably be given under clause 9 of the detail specification.]

Subclause	Parameters	Symbol	Value		
			min.	max.	unit
4.1	Supply voltage (Note 1)	V_{CC}	x	x	V
		V_{EE}	x	x	V
4.2	Differential-mode input d.c. voltage (Note 1)	V_{ID}	x	x	V
4.3	Common-mode input d.c. voltage (Note 1)	V_{IC}	x	x	V
4.4	Power dissipation	P_{tot}		x	W
4.5	Operating temperature	T_{amb}	x	x	°C
4.6	Storage temperature	T_{stg}	x	x	°C
4.7	Output current	I_O		x	mA
4.8	Short-circuit output current	I_{OS}		x	mA
	If applicable: short-circuit duration	t_{OS}		x	s

Note 1. - A voltage reference shall be defined.

5 Operating conditions (within the specified operating temperature range)

Operating conditions are specified in the relevant measuring methods.

See subclause 13.2 of this standard for inspection requirements.

5.1 Power supply voltage

5.2 Input voltage(s)

5.3 Output current(s)

5.4 Voltage and/or current at other terminal(s)

5.5 External elements (where appropriate)

5.6 Operating temperature range

6 Electrical characteristics

The requirements for these characteristics are based on fundamental integrated operational amplifiers.

[When several devices are defined in the same detail specification, the relevant values should be given on successive lines, avoiding repeating identical values.]

[Curves should preferably be given under clause 9 of the detail specification.]

The following characteristics apply over the full operating ambient temperature range, unless otherwise stated.

[Where the stated performance of the circuit varies over the operating ambient temperature range, the values of the appropriate characteristics shall be stated at 25 °C and at the extremes of the operating temperature range.]

6.1 *Static characteristics*

Sub-clause	Static characteristics	Symbol	Value			
			min.	typ. Note 2	max.	unit
6.1.1	Input offset voltage	V_{IO}		x	x	mV
6.1.2	Input offset current	I_{IO}		(x)	x	mA
6.1.3	Input bias current	I_{IB}		(x)	x	mA
6.1.4	Differential-mode voltage amplification	A_{VD}	x	(x)	x	dB or an absolute number
6.1.5	Output voltage swing	V_{OPP}	x	(x)		V
6.1.6	Power supply current	I_S		(x)	x	mA
6.1.7	Common-mode rejection ratio	k_{CMR} (+)	x	(x)		dB
6.1.8	Supply voltage rejection ratio	k_{SVR} (+)	x	(x)		V/μV
		k_{SVR} (-)		(x)	x	or dB
	or	or				
	Supply voltage sensitivity	k_{SVS} (+)	x	(x)		V/μV
		k_{SVS} (-)	x	(x)		or dB
6.1.9	Short circuit output current	I_{OS} (+)		(x)	x	mA
		I_{OS} (-) Note 3	x	(x)		mA
6.1.10	Common-mode input d.c. voltage range	V_{IC} (+)	x	(x)		V
		V_{IC} (-)		(x)	x	V
6.1.11	Mean temperature coefficient of input offset voltage				x Note 4	%/K or %/°C
6.1.12	Mean temperature coefficient of input offset current				x Note 4	%/K or %/°C
6.1.13	Small signal input impedance (differential mode)	Z_{id}		(x) Note 4		kΩ
6.1.14	Output impedance (single-ended)	Z_{os}		(x) Note 4		Ω

Note 2. - The insertion of typical values is optional. For operational amplifiers, typical values are recommended.

Note 3. - The value of I_{OS}(-) may be specified in the detail specification if necessary.

Note 4. - When specified in the detail specification.

6.2 *Dynamic characteristics*

As required by the detail specification in accordance with IEC 748-3.

Sub-clause	Dynamic characteristics	Symbol	Value			
			min.	typ.	max.	unit
6.2.1	Unity-gain frequency or Real gain-bandwidth product	f_1 or GWR	x			Hz
6.2.2	Upper limiting frequency for full output voltage swing	f_w	x			Hz
6.2.3	*Output noise voltage*	V_{no}			x	Note 1
6.2.4	Average rate of change of the output voltage Note 2	S_{voav}	x			V/µs
6.2.5	Cross-talk attenuation (where applicable)	a_x	x			dB
6.2.6	Response time				x	µs

Note 5.- The unit shall be given in the detail specification.

Note 6.- Both positive- and negative- going slew rate to be specified, when appropriate.

7 Programming

Not applicable.

8 Mechanical and environmental ratings, characteristics and data

[Any specific mechanical and/or environmental ratings applicable should be required here in accordance with subclause 10.8 of IEC 748-1, Amendment 1, chapter VI (see also IEC 747-1, chapter VI, clause 7).]

9 Additional information

The information here is not for inspection purposes.

The following information is given as minimum design data:

9.1 *Block diagram*

[A block diagram or equivalent circuit information for the integrated circuit shall be given.]

9.2 *Output loading capability*

[Information on the output loading capability shall be given.]

9.3 *Effects of temperature and input and/or output loading*

[Variations of input offset voltage, input offset current and input bias current information with temperature shall be given. This information shall also be given, where appropriate, with respect to input and/or output loading.]

9.4 *Handling precautions*

[Any limiting mechanical or environmental conditions shall be included, for example, the handling of FET input operational amplifiers.]

10 Screening

[When necessary, technical requirements should be supplemented by the blank detail specification and refer to clause 8 of sectional specification.]

11 Quality assessment procedures

The blank detail specification should specify whether the qualification approval procedure or capability approval procedure is applicable.

11.1 *Qualification approval procedure*

See generic specification, clause 3 and sectional specification, subclause 5.1.

11.2 *Capability approval procedure*

See IEC Publication 747-10.

12 Structural similarity procedures

See clause 6 of the sectional specification.

13 Test conditions and inspection requirements

The blank detail specification is used to maintain a uniform prescription of tests in the detail specifications.

13.1 *Sampling requirements and formation of inspection lots*

For the sampling requirements, see clause 9 of the sectional specification and subclause 3.7 of the generic specification.

For group A, the choice between the AQL and the LTPD system shall be made in the detail specification.

For the formation of inspection lots, see subclause 5.1.1 of the sectional specification and subclause 12.2 of the Rules of Procedure (IEC Publication QC 001002).

If the procedure of structurally similar devices is applied, see clause 6 of the sectional specification and subclause 8.5.3 of the Rules of Procedure.

When method *a)* of the Rules of Procedure, subclause 11.3.1, is used for qualification approval, the detail specification shall give the sampling requirements. (See also clause 9 of the sectional specification.)

13.2 *Inspection tables*

[The sequences of tests are given in the following tables, where the values and exact test conditions to be used shall be specified as required for a given type, and as required by the relevant test in the relevant publication.]

[The choice between alternative tests or test methods shall be made when a detail specification is written.]

[When several devices are included in the same detail specification, the relevant conditions and/or values should be given on successive lines, where possible avoiding repetition of identical conditions and/or values.]

GROUP A

Lot by lot

All tests are non-destructive (see subclause 3.6.6 of the generic specification)

Inspection or test	Symbol	Ref. (Sub-clause)	Conditions at T_{amb} = 25 °C unless otherwise specified (see clause 4 of the generic specification)	Inspection requirement limits	
				min.	max.
Sub-group A1					
External visual examination		4.2.1.1 of 747-10			
Sub-group A2					
Differential-mode voltage amplification	A_{VD}	6.1.4*	As specified [$T = T_{amb}$ max. $T = T_{amb}$ min. when specified]	x	
Sub-group A3					
Input offset voltage	V_{IO}	6.1.1*	As specified		x
Input offset current	I_{IO}	6.1.2*	As specified		x
Input bias current	I_{IB}	6.1.3*	As specified		x
Output voltage swing	V_{OPP}	6.1.5*	As specified	x	
Power supply current	I_S	6.1.6*	As specified		x
Mean temperature coefficient of input offset voltage		6.1.11*	When specified in the detail specification		
Mean temperature coefficient of input offset current		6.1.12*	When specified in the detail specification		
Common mode rejection ratio	k_{CMR} (+)	6.1.7*	As specified	x	
Supply voltage rejection ratio or supply voltage sensitivity	k_{SVR} (+) k_{SVR} (-) or k_{SVS} (+) k_{SVS} (-)	6.1.8*	As specified	x x	x x
Common mode input d.c. voltage range	V_{IC} (+) V_{IC} (-)	6.1.10*	As specified	x	 x
Short circuit output current	I_{OS} (+) I_{OS} (-)	6.1.9*	As specified	 x	x

(Continued on page 12)

GROUP A - *Lot by lot (concluded)*

Inspection or test	Symbol	Ref. (Sub-clause)	Conditions at T_{amb} = 25 °C unless otherwise specified (see clause 4 of the generic specification)	Inspection requirement limits	
				min.	max.
Sub-group A3a (Same as A3)			T_{amb} min. T_{amb} max. [in accordance with 4.5*]		
Sub-group A4					
Unity-gain frequency or Real gain-bandwidth product	f_1 or *GWR*	6.2.1*	As specified	x	
Upper-limiting frequency for full output voltage swing	f_w	6.2.2*	As specified	x	
Output noise voltage	V_{no}	6.2.3*	As specified		x
Average rate of change of the output voltage	S_{voav}	6.2.4*	As specified	x	
Crosstalk attenuation	a_x	6.2.5*	As specified	x	
Response time		6.2.6*	As specified		x

Of this standard.

GROUP B

Lot by lot

(In the case of Category I, see the generic specification, subclause 2.6)

LSL = lower specification limit
USS = upper specification limit
} from Group A

Only tests marked (D) are destructive (3.6.6)

Inspection or test	Ref.	Conditions at T_{amb} = 25 °C unless otherwise specified (see clause 4 of the generic specification)	Inspection requirement limits	
			min.	max.
Sub-group B1 Dimensions	747-10, Subcl. 4.2.2 and annex B		[See box 7 page 9]	
Sub-group B4 Solderability	749, ch. II, Subcl. 2.1	[To be specified]	Good wetting	
Sub-group B5 (D) Rapid change of temperature:				
a) Cavity packages				
Rapid change of temperature	749, ch. III, Subcl. 1.1	10 cycles		
followed by:				
· Sealing, fine leak detection	749, ch. III, Subcl. 7.3 or 7.4	[To be specified]		
and:				
· Sealing, gross leak detection	68-2-17, test Qc	[To be specified]		
· Electrical tests	[Relevant publication]	[To be selected from Sub-groups A2 and A3]		
b) Non-cavity and epoxy-sealed cavity devices				
Rapid change of temperature	749, ch. III, Subcl. 1.1	10 cycles		
followed by:				
· External visual examination	747-10, subcl. 4.2.1.1			
· Damp heat, steady state	749, ch. III, 5B	Severity 1 (85 °C, 85 % R.H.), 24 h		
· Electrical tests	[Relevant publication]	[To be selected from Sub-group A2 and A3]		
Sub-group B8 Electrical endurance (168 h)	[See the relevant publication]	Conditions as specified in sub-clause 12.3 and if applicable subclause 12.4 of the sectional specification		
with final measurements:				
Sub-group CRRL	Attributes information for B4, B5 and B8			

GROUP C

Periodic

Only tests marked (D) are destructive (3.6.6)

Inspection or test	Ref.	Conditions at T_{amb} = 25 °C unless otherwise specified (see clause 4 of the generic specification)	Inspection requirement limits	
			min.	max.
Sub-group C1 Dimensions	747-10, Subcl. 4.2.2 and annex B			
Sub-group C2b Verification of the function at T_{amb} max. and T_{amb} min.		Same as in A2		
Sub-group C2c Verification of the common-mode input d.c. voltage V_{IC}		Same as in A3a at T_{amb} max. and T_{amb} min.		
Sub-group C3 (D) Robustness of terminations and lead bending	749, ch. II, cl. 1 748-11	[To be specified where appropriate for the package; for example, tensile or torque]		
Sub-group C4 (D) Resistance to soldering heat	749, ch. II, Subcl. 2.2	[To be specified]		
with final measurements:		[To be selected from Sub-groups A2 and A3]		
Sub-group C5 (D) Rapid change of temperature:				
a) Cavity package				
Rapid change of temperature	749, ch. III, Subcl. 1.1	10 cycles		
followed by:				
Sealing, fine leak detection	749, ch. III, Subcl. 7.3 or 7.4	[To be specified]		
and:				
Sealing, gross leak detection	68-2-17, test Qc	[To be specified]		
Electrical tests	[Relevant publication]	[To be selected from Sub-groups A2 and A3]		

(Continued on page 15)

GROUP C - *Periodic (concluded)*

Inspection or test	Ref.	Conditions at T_{amb} = 25 °C unless otherwise specified (see clause 4 of the generic specification)	Inspection requirement limits	
			min.	max.
Sub-group C5 (continued)				
b) Non-cavity and epoxy-sealed cavity packages				
Rapid change of temperature	749, ch. III, subcl. 1.1	500 cycles, once a year		
followed by:				
· External visual examination	747-10, subcl. 4.2.1.1			
· Damp heat, steady state	749, ch. III, 5B	Severity 1 (85 °C, 85 % R.H.), 24 h		
· Electrical tests	[Relevant publication]	[To be selected from Sub-groups A2 and A3]		
Sub-group C6 (D)				
Acceleration, steady state (for cavity devices only)	749, ch. II, cl. 5	[To be specified]		
with final measurements:		[To be selected from Sub-groups A2 and A3]		
Sub-group C7 (D)				
Damp heat, steady state:				
a) Cavity packages	749, ch. III, 5A	Severity: [56 days for categories II and III, 21 days for category I]		
b) Non-cavity and epoxy-sealed cavity packages	749, ch. III, 5B	Severity 1 (85 °C, 85 % R.H.) Bias: [To be specified in the detail specification] Duration: [1 000 h for categories II and III, 500 h for category I]		
followed by:				
· Electrical tests	[Relevant publication]	[To be selected from Sub-groups A2 and A3]		
Sub-group C8 (D)				
Electrical endurance	[Relevant publication]	1 000 h [Temperature to be specified]		
Sub-group C9 (D)				
Storage at high temperature	[Relevant publication]	1 000 h [Temperature to be specified]		
Sub-group C11				
Permanence of marking		[As specified]		
Sub-group C12				
Transient energy	Publication under consideration	Test voltage specified in detail specification		
Sub-group CRRL	Attributes information for Sub-groups C3, C4, C6, C7, C8, C9 and C11			

GROUP D

Qualification approval tests

When required, these tests shall be prescribed in the detail specification for qualification approval only.

Inspection or test	Symbol	Ref. (Subclause)	Conditions at T_{amb} = 25 °C unless otherwise specified (see clause 4 of the generic specification)	Inspection requirement limits	
				min.	max.
Sub-group D2 Power supply current(s)	I_s	6.1.6*	[As specified]		x
Sub-group D8 (D) Electrical endurance (see subclause 12.4 of the sectional specification for accelerated test procedures)		[Relevant publication]	For category II: 2 000 h For category III: 4 000 h [Note 1] Conditions: [Note 2]		

* Of this standard.

Note 1.- The endurance durations are shown as the accumulated time for Group C and D endurances.

Note 2.- The conditions under which endurance tests are carried out shall be determined as follows:

The choice of power dissipation, operating temperature and supply voltage shall be made in the following order of precedence:

a) The mean power dissipation in each functionally accessible section of the circuit shall be the maximum permitted by the detail specification.

b) The ambient or reference-point temperature shall be the maximum permitted by the detail specification at the power dissipation of a).

c) The supply voltages shall be the same as specified in parameter characteristics 5A and 5B.

13.3 *Delayed deliveries*

[See IEC Publication 747-10, subclause 3.6.7, unless otherwise specified.]

14 Additional measurement method

Not applicable.